May 12, 1995 CD-95-08(LDV)

Dear Manufacturer:

Subject: Analytical Derived Fuel Economy (ADFE)

This letter addresses updates to the guidelines applicable to the use of ADFE. The changes are being implemented to reduce testing and administrative costs while maintaining the integrity of the fuel economy database. The analytical equation and procedures discussed in this letter are effective immediately and replace the guidance on ADFE presented in Advisory Circular 83A (A/C 83A). These updated guidelines are available optionally through the 1996 model year and will fully replace the AC 83A guidelines for subsequent model years unless EPA receives comments to cause us to consider there is a critical need to retain the guidelines for limited special cases.

The American Automobile Manufacturers Association (AAMA) approached EPA with concerns about the increasing testing burden associated with new regulatory requirements. AAMA suggested allowing expanded use of ADFE as a means to address its concerns.

The concept of ADFE has been available from the beginning of the fuel economy program. The provision of 40 CFR 600.006-89(e) allow EPA to accept analytical expressions to generate fuel economy data. A fuel economy sensitivity equation developed by Energy and Environmental Analysis, Inc. in the early 1980's has been used in conjunction with the A/C 83A to implement the ADFE regulation provision. Specifically, EPA has only approved ADFE when all the following conditions were met:

- The manufacturer no longer had sufficient lead-time or available test vehicles to conduct actual tests,
- The manufacturer had test data on a comparable vehicle,
- The adjusted fuel economy could not be higher than the actual test used as a baseline, and
- The ADFE procedure was used to satisfy a <u>required</u> subconfiguration test condition.

EPA agreed to consider revising the practice to allow increased use of ADFE provided that a new regression equation was developed using up-to-date data that had a conservative bias. EPA has worked with AAMA to develop a new procedure that satisfies this criterion.

The procedures which are discussed today are largely an outgrowth of those AAMA discussions. However, one provision has been added in this procedure from the AAMA proposal. EPA retains the right to order actual confirmatory testing if EPA believes it is necessary to assure the integrity of the fuel economy data base or if there is a concern about emissions compliance.

Key features include:

1. New Fuel Economy Sensitivity Coefficients.

   New coefficients have been developed from an analysis of 2193 records in the Berger, Smith, Andrews database of 1988-1990 EPA Test Data for all manufactures.

2. Additional Parameter for Tire and Chassis Loses.

   EPA has been using a three parameter equation for ADFE calculation - equivalent test weight class (ETW), dynamometer power absorption (DPA) setting, and N/V (engine rpm / vehicle velocity in top gear). EPA recognizes that DPA alone may not adequately capture the fuel economy impact of certain tire changes. Consequently, a fourth parameter has been added to account for differences in tire and chassis loss (TCL).

3. Confidence Limits to Assure Conservative Coefficients.

   Sensitivity coefficients will be increased to the upper 95 percent confidence limit when a parameter is increasing (e.g., ADFE test weight greater than the tested test weight). Sensitivity coefficients will be decreased to the lower 95 percent confidence limits when the parameter is decreasing. This will improve the assurance that fuel economy decreases are overstated and fuel economy increases are understated leading to a conservative bias to the new ADFE procedures.

4. Baseline Test Selection Restrictions.

In order to limit any impact associated with "picking and choosing" a favorable baseline test, baseline tests selection will be restricted. A procedure has been established (see the enclosure for details) to identify a pool of tests which are candidates for selection as the baseline test for any desired ADFE subconfiguration. The baseline test selected will be the tested subconfiguration which is closest to the ADFE subconfiguration, thus, will yield the smallest MPG adjustment. Additionally, no test may be used as a baseline for more than five ADFE in a model year.

5. Fuel Economy Adjustment Limits.

The maximum upward adjustment of the fuel economy by the ADFE methods is 10 percent from the baseline test. Downward adjustments will be applied without limit.

6. ADFE Use Restrictions.

Manufacturers must attest that they have not used an ADFE for any subconfiguration for which an actual test has been run during the certification process or on a development vehicle which is eligible be declared as a fuel economy data vehicle.

Also, to limit the impact of ADFE on CAFE, no more than 20 percent of the subconfigurations tested in a manufacturers final CAFE may be represented by ADFE.

7. ADFE may not be used on High Visibility Labels.

For Passenger Automobile labels - manufacturers may not use any ADFE with a combined fuel economy of less than 1.0 mpg above the Gas Guzzler Tax $0 threshold (currently this limit is 23.5 mpg).

For Passenger Automobiles and Light Truck labels - manufacturers may not use any ADFE with a composite fuel economy greater than or equal to the leader in the applicable Vehicle Classification Class based on the previous model year.

8. EPA Retains the Right to Confirmatory Testing.

If EPA determines that it is necessary to assure the integrity of the fuel economy database or if EPA has concerns about compliance with emission standards, EPA retains the right to order a confirmatory test of the subconfiguration covered by the ADFE.

If the manufacturer chooses, EPA will accept a temporary Fuel Economy Label based on the ADFE while a suitable date vehicle is being procured. However, if the confirmatory test value results in a lower rounded fuel economy value (city, highway, or combined) for any model type the label must be updated. The updated label value shall be used on all vehicles produced more than 15 days following its submission.

Additional details about the sensitivity coefficients, baseline test selection, restriction, and required documentation are included in the enclosure.

EPA believes these updated ADFE guidelines represent a reasonable balance between the need for accurate fuel economy data and the need to contain the cost of testing for both industry and EPA. Manufacturers should contact their Certification Team Representative if they have any question related to this new procedure.

Sincerely,

Robert E. Maxwell, Director
Certification Division

Enclosures

Updated Analytical Derived Fuel Economy (ADFE) Guidelines as of May 4, 1995

1. Without prior EPA approval, manufacturers may select the baseline test to be used for an ADFE, providing the following guidelines are followed:

   a. Vehicles considered for selection for the baseline test must pass all applicable standards in the model year associated with the ADFE.

   b. All official tests (which pass all applicable standards) of the same or equivalent basic engine, transmission class, engine code, transmission code, engine horsepower, and compression ratio as the ADFE subconfiguration must be included in the pool of tests which will be considered for baseline selection.

   c. In order to minimize the mpg adjustment, the manufacturer may supplement the pool with tests associated with worse case engine or transmission codes and carryover or carry-across engine families. In these cases, all the data which qualifies for inclusion using the elected worse-case substitution (or carryover or carry-across) must be included in the pool as supplemental data (I.e., individual test vehicles may not be selected for inclusion). Once the manufacturer decides to supplement the pool in this manner, the supplemental data must be included in all subsequent pools, where applicable.

   d. To limit the effect of an "above average" test, tests previously used during the subject model year as baseline tests in five other ADFE subconfigurations must be eliminated from the pool.

   e. All remaining tested subconfigurations in the pool must be evaluated against the target ADFE subconfiguration by using the new four-parameter composite mpg coefficient including the 95% confidence limits.

   f. The tested subconfiguration with the smallest net combined fuel economy adjustment (i.e., smallest absolute value of (ADFE - test FE)) for combined fuel economy) will be selected as the baseline test for the target ADFE subconfiguration and used for both city and highway adjustments.

2. Any proposed baseline test not selected according to the provisions of paragraph 1 (above), must be reviewed and approved by EPA on a case-by-case basis.

3. The ADFE will be calculated using the four-parameter 95% confidence limits as listed on the attached table. The result shall be rounded to a tenth of an mpg. The upward adjustment of ADFE from the baseline shall be limited to 10% over the baseline fuel economy (i.e, baseline fuel economy X 1.1). The downward adjust is not limited.

4. Manufacturers may not submit an ADFE if an actual test has been run on the target subconfiguration during the certification process or on a development vehicle which is eligible be declared as a fuel economy data vehicle.

5. To reduce the possibility that ADFE may affect a potential high visibility label calculation:

   a. For Passenger Automobile labels - manufacturers may not use any ADFE with a combined fuel economy of less than 1.0 mpg above the Gas Guzzler Tax $0 threshold (currently this limit is 23.5 mpg).

   b. For Passenger Automobiles and Light Truck labels - manufacturers may not use any ADFE with a combined fuel economy greater than or equal to the leader in the applicable Vehicle Classification Class based on the previous model year's unadjusted general label values rounded to a whole mpg. If manufacturers are unaware of these values they must contact their Certification Team Representative before using ADFE.

6. To limit the impact of ADFE on CAFE, no more than 20 percent of the subconfigurations tested in a manufacturers final CAFE may be represented by ADFE. For example, if the manufacturer has 100 subconfigurations which are tested (or represented through data substitutions and equivalencies), only 20 of the 100 may be based on ADFE calculations (or represented through data substitutions or equivalencies from ADFE generated data points).

7. For each ADFE, manufacturers will submit a form showing the baseline vehicle with its fuel economy results and cert levels (emission levels adjusted by the dfs) (the cert level reporting requirement may be replaced by a statement that none of the cert levels for the baseline vehicle are greater-than-or-equal-to 90% of the standards applicable to the ADFE subconfiguration), the target ADFE

subconfiguration, the calculated city and highway fuel economies, and the EPA test numbers of the ADFE test-type 32 tests.

The manufacturers must retain for six years (under the provisions of 40 CFR 86.096-7) the pool of tests, the vehicle description and tests chosen as the baseline and the basis for its selection, the target ADFE subconfiguration and the calculated city and highway adjusted fuel economy. EPA may request this information as part of an audit of information.

8. If EPA determines that it is necessary to assure the integrity of the fuel economy database or if EPA has concerns about compliance with emission standards, EPA retains the right to order a confirmatory test of the subconfiguration covered by the ADFE.

   If the manufacturer chooses, EPA will accept a temporary Fuel Economy Label based on the ADFE while a suitable data vehicle is being procured. However, if the confirmatory test value results in a lower rounded fuel economy value (city, highway, or combined) for any model type the label must be updated. The updated label value shall be used on all vehicles produced more than 15 days following its submission.

9. EPA is presenting this option as a manufacturer self-approval process. EPA will not be responding to routine submissions of ADFE data indicating our acceptance of the calculation or waiver of confirmatory testing. While EPA is not granting an automatic waiver to data after a certain period has passed, EPA intends to indicate the need for confirmatory testing with 15 days of the receipt of the information submitted under paragraph 7.

   If EPA later discovers that the procedures for self-approval were not followed, EPA may rescind the use of ADFE data and require actual test data be generated and require recalculation of labels and CAFE values.